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Translation No. 5

The Werner-Henneberger Accident

Case History No. 33 from "Schnee und Lawinen in den Schweizeralpen, Winter 1963/64." Winterbericht des Eidg. Institutes für Schnee- und Lawinenforschung

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INTRODUCTION

Each year the Swiss Federal Institute for Snow and Avalanche Research compiles a comprehensive report on snow and avalanches in the Swiss Alps. This report, entitled "Schnee und Lawinen in den Schweizeralpen," is published about a year and a half after the winter in question. Part of the report is a detailed compilation of avalanche accident case histories. From the report for the winter of 1963/64 we have translated the account of an accident which had widespread publicity both in the U.S. and abroad. This is the accident which caused the death of Buddy Werner, America's outstanding racer, and Barbara Henneberger from Germany. Because many conflicting reports were circulated here about the accident and its subsequent legal ramifications, we have translated the official Swiss Government report in order to present to the American skiers an accurate account of the event.

This case history is No. 33 in the Swiss compilation for 1963/64. A dense mountain population and extensive avalanche terrain generates in Switzerland a much higher avalanche hazard than we know in the United States. There are many more accidents. Since the Winter of 1940/41 there have been an average of 24 deaths a year in Switzerland from snow avalanches. In 1963/64 there were 37 accidents involving 105 people, of whom 15 were injured and 33 died. But even among these many misfortunes, the Werner-Henneberger accident occasioned extraordinary interest and in Switzerland set an unusual precedent, as the report shows.

No. 33 April 12, 1964 Ski Racer Accident in the Engadine

The victims: Miss Henneberger, born October 4, 1940, student from Munich; Bud W. Werner, born February 2, 1936, student from Lakewood, Colo., USA.

I Preliminary Remarks

The avalanche misfortune in Val Selin has experienced more world-wide than any other of its kind. It has furnished abundant material for discussion by experts and laymen alike. This can be explained by two reasons: On one hand it involved as victims leading skiers from Germany and USA who were known throughout the skiing world; on the other hand it brought in its wake a criminal proceeding which frequently found extensive space in the daily and specialist press as the "Bogner Case," and which has occupied the courts until very recently. The case was finally decided just before this report went to press.

II The Accident Occurrence

At the beginning of April a group of men and women ski racers from several countries were in the Engadine at the invitation of the German W. Bogner to work with him on a new ski film. On the morning of the accident day the company went by ski lift from Marguns to Trais Fluors at around 2750 m. The weather was exceptionally fine. The group was to ski for the next scene close together, making short turns down the fall line of a steep slope. The chosen site was the completely undisturbed southwest slope of the Selin Basin; three cameras were located along the right-hand ridge.

About 1010 hours the 14 skiers entered the steep slope, close together and making linked turns. Immediately after the last skier had left the safe crest, the snow cover broke beneath him and at the same time the snow on the entire slope was set in motion. It flowed with accelerating velocity into the valley, carrying the skiers with it. W. Bogner, who was in the lead, alone was able to ski across the lateral fracture line to a safe location beneath

some prominent rock outcrops. Some of the endangered skiers tried to save themselves by a wild schuss, others were tumbled over and swept away.

B. Henneberger's flight also succeeded, for she reached the valley floor well ahead of the avalanche front and definitely would have escaped from it. But shortly after the first avalanche, a secondary one was released from the opposite slope and fell toward the same deposition zone. Its front overwhelmed the unlucky B. Henneberger and the young skier disappeared into the piled-up snow of the two colliding avalanches along with her comrade, B. Werner. Of the trapped skiers--the secondary avalanche had caught one cameraman--10 were only partly buried or not at all and could free themselves unharmed. No skiers were completely buried but could be quickly located from skis or poles sticking out of the snow; they were also extricated uninjured. B. Henneberger and B. Werner were missing.

III. The Rescue Action

The first rescue party arrived relatively quickly, but before beginning the search attempted to shoot down with rockets the snow still hanging on the slope between the two fallen avalanches. This action produced no results and the probing began about 1130. At 1135 the first avalanche dog leader arrived, quickly followed by seven additional teams, not all of whom participated in the search.

Search by the dogs produced no results. At 1310 the well-led rescue action had its first success; the body of Bud Werner was located under 3 m of heavy, compacted snow. At 1441 that of B. Henneberger was found at the same depth and only a short distance away. Unfortunately the revival efforts of several doctors remained fruitless.

IV. Remarks

1. The prosecuting attorney for Graubünden commissioned our Institute (M. Schild as expert witness) to answer various questions. From these expert opinions the following questions and answers concerning snow technology are reproduced:

Question: How do you evaluate the snow cover, the meteorological conditions and the character of the terrain in regard to the avalanche situation at 1000 hrs., April 12, 1964 in Val Selin?

Answer:

a. Terrain: The upper part of Val Selin in question forms a terrain funnel about 300 m wide opening to the south. It includes slopes exposed to the SE-S-SW, with small connecting zones oriented to the E and W. The slope profiles are uniform throughout and the slope varies between 30° and 36°; the flatter parts of the slopes are on the N-S valley axis, the steepest parts are found on the SW slope (accident site of April 12, 1964) as well as on the Eigenmann slope north of the secondary avalanche of April 12. Between the individual slopes there generally are poorly formed vertical ridges which do not reliably prevent avalanche propogation from one slope to another. The only exception is the rock outcrop which closes off the SW slope on the down-valley side and which formed the lateral boundary of the April 12, 1964 accident avalanche.

As a result of the altitude from 2600 to 2700 m and the geological conditions, the whole Selin Basin is practically free of vegetation and appreciable ground roughness; only a few isolated cliffs or rock forma-

tions are able to penetrate through the snow cover. The terrain conditions in upper Val Selin in general are relatively favorable (for avalanches--tr.), considering the transformation of the lower layers of the snow cover into snow of poor load-bearing capacity. On north and east slopes as well as areas of rough terrain surface (boulders, alpenrose bushes, scrub pine, etc.) the snow cover experienced a widespread and severe development of dangerous layering. On the other hand this terrain basin serves as a catchment bowl for drifting snow, which can often be blown in large quantities from the west, north and east. In addition the slopes are not steep enough to develop frequent avalanching without external triggers. The release of the snow masses thus often occurs only through an external and objective disturbance, such as the passage of a skier.

b. Snow Cover: The winter just past occupies without a doubt a special place among the nearly 30 winters recorded by Swiss snow and avalanche research. The widespread lack of snow throughout the Alps stood in contrast to extraordinarily vigorous avalanche activity. The causes of this are on one hand the early November snowfalls and on the other a dearth of precipitation lasting late into the winter. The November snow lay uncovered for an extraordinarily long time and thus experienced a very strong transformation into a coarse-grained, poorly-cohering depth hoar layer. At lower elevations and on sunny slopes this snow cover was melted away or changed to an icy crust by long periods of fair weather. Here a new snow accumulation found a relatively favorable anchorage and in such places few avalanches occurred. Above 2000 m and down to 1400 m on shaded slopes the new snow fell on a cohesionless base

and could neither adhere or become consolidated because it fell only in small quantities at a time. Thus a snow blanket was formed on such slopes which consisted of poorly consolidated snow layers of low bearing capacity resting on a completely loose base. In most cases the slightest disturbance was enough to provoke fracturing. This development appeared very early and persisted until late in the winter.

The thawing of the entire snow cover and locally heavier snowfalls did not cause any basic changes and in any case did not improve the situation.

c. The Situation in Val Selin on April 12, 1964, 1000 hrs: The days prior to April 12, 1964 had generally been clear with high daytime temperatures and low snow surface temperatures in the morning caused by radiation cooling. The snow cover in upper Val Selin was wet completely through and froze only at night to a depth of 10 or 15 cm below the surface. Under this surface layer was still rather firm snow which must have originated from the various light snowfalls since the middle of March. These earlier layers were separated from the extremely loose and strongly developed depth hoar by a typical surface hoar horizon which still further reduced the snow cover stability.

Very fair weather prevailed at the time of the accident and the sun shone on the slope in question. In contrast to early morning, the temperature was rising. Softening of the surface crust formed during the night had only just begun and had affected only the top 1-2 cm.

See the accompanying profile sketch. It shows an instability of the snow cover not previously observed to such a degree, and explains

that on the day of the accident the avalanche conditions in Val Selin were objectively worse and more treacherous than at similar times in other years. (Weather data from expert opinion of April 16, 1964.)

(From expert opinion of May 1, 1964, Question No. 2)

Question: Was the accident slope in sunshine at the time of the accident, and how long had it been in the sun? Did the sunshine contribute to the fall of the avalanche, or must it be assumed that the sun had practically no influence on release of the slab?

Answer: The accident slope as well as its fracture zone lay in the sun when the accident party skied onto it. As an estimate--the applicable measurements for the present are not completed--the solar radiation up to this time lasted around one and one-half hours. Basically the radiation resulted in softening of the frozen surface layer and thus encouraged fracture of the snow cover. The share of this objective cause of release in the overall influences on release of the slab avalanche must have had a subordinate significance, above all on account of the very oblique angle of the sun's rays and the consequent strongly reduced effectiveness. As an estimate--based on the conditions two days later--the softening from solar radiation must have encompassed the top 1-2 cm. I amconvinced from this that, other things being equal, the accident would also have occurred before the sun rose.

In the meantime the film of the accident occurrence had been processed and the investigation agencies and experts had the opportunity to view this moving document. Material in this picture opened up the possibilities for

further clarification and judgement, which was added to the documentation by the expert opinion of May 14, 1964:

a. State of the Accident Slope Immediately Before the Accident

The condition of the snow cover was described in the expert opinion of May 1, 1964. What was not then known or taken into consideration--because unknown and not reconstructible from the investigation of April 14--was the fact that many surface sluffs were visible on the accident slope. As far as could be determined from the film, these sluffs covered the entrance zone over most of the slope and only at the south end did they leave free a continuous vertical stretch, namely the zone chosen fro the ill-fated descent.

The question is then raised, whether these sluffs were evidence of avalanche conditions on this slope, and what kind of conclusions could have been drawn from them.

These small avalanches took the form of falling surface snow masses which either slid without external cause or else had been dislodged by snow chunks from cornices, overhanging rocks or caused by skiers. Time of their occurrence must have been after a warm period or after intensive radiation such as in late afternoon, but in any case at a time when the surface crust had softened to an appreciable depth and lost its bearing capacity. Even if these sliding masses are relatively small avalanches, they exercise a definite disturbance on the underlying layers. In the foregoing case the snow weight alone of these sluffs must have amounted to 500 tons; even if the wet snowslides came down individually--as apparently must have been the case--a very significant loading of the snow cover by

the running of individual parts must have occurred. The snow cover had withstood this loading, even at the time of reduced bearing capacity. It is a generally valid assumption made by experienced alpinists that, as a rough rule, no more danger exists on such a slope after the running of surface snow sluffs, and especially not after the refreezing of the remaining snow surface. This judgement ought still to have future validity as a rule of thumb even when several exceptions--especially on steep zones--are known.

b. Tracks in the Accident Terrain

Up to this point the question of whether new ski tracks had been present at the accident site was controversial and unresolved. The film also brought clarification to this subject. It is clearly established that on the slope slightly south of the marked rock outcrops and with the same orientation as the accident slope, there had been numerous tracks present at the time of the accident. It was also established that at least three skiers had crossed the accident slope in the direction of the rock tooth. According to testimony of the accident party, these tracks would have run down the fall line to the valley north of the rocks, that is, in the zone of the primary avalanche. Because the actual extension of these ski tracks south of the rocks cannot be recognized in the film, it is assumed that the skiers concerned descended in a direction toward the basin where the accident occurred. In reference to the time at which the unknown skiers made these tracks, I conclude this must have been Saturday noon or afternoon. Sunday morning is excluded, for the tracks had been made in significantly softer snow than would have been present here before 1000 hrs. on Sunday.

An earlier time than Saturday is unlikely, for the tracks at the time the film was taken would have experienced more melt and thus would have been less clearly recognizable.

Whether still other ski tracks had been present in the upper part of the Val Selin basin, as mentioned and designated on the accompanying photos, could not be determined from the film.

c. Release of the Secondary Avalanche

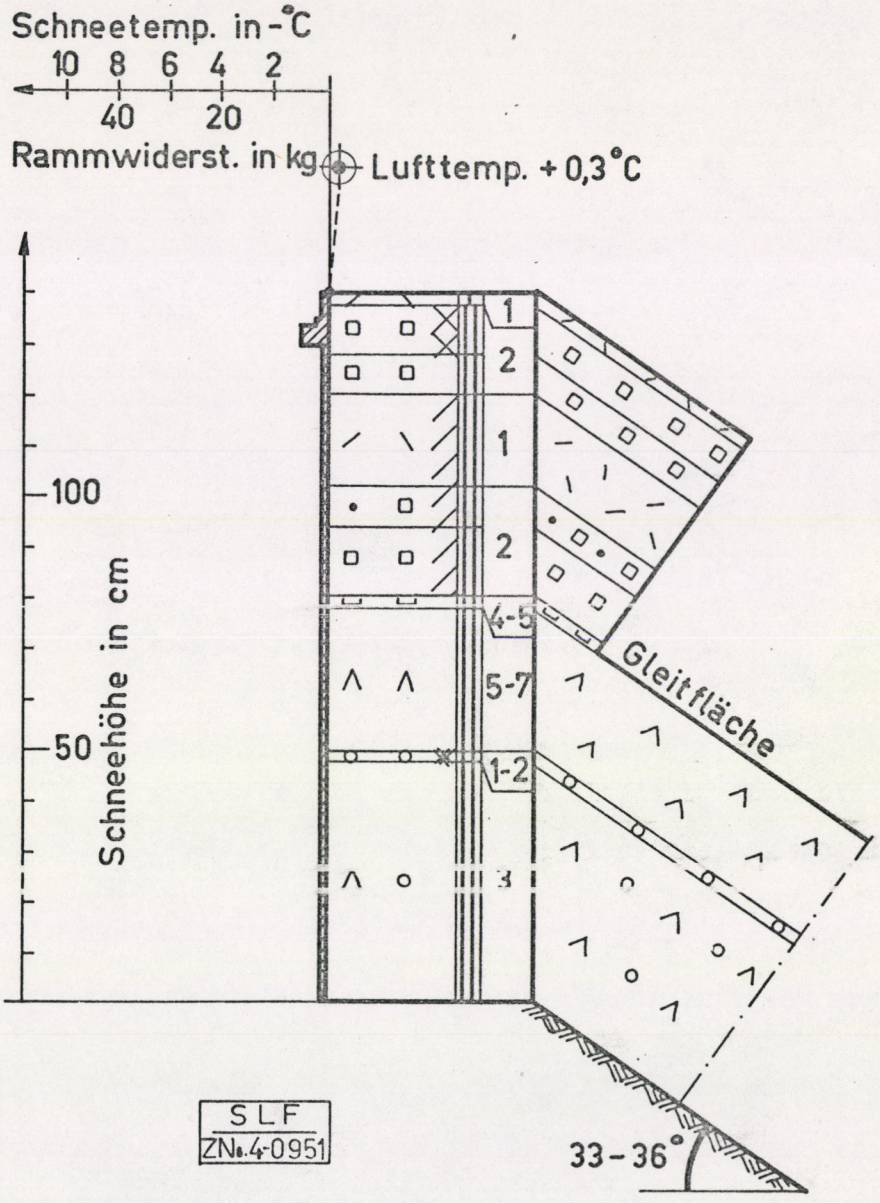
On the basis of the testimony, it had been assumed up to this point that the secondary avalanche must have been mainly released by the shearing action of the primary avalanche in the Val Selin Basin. This review was contradicted by the film, in which the nose of the second avalanche had reached the foot of the slope only a split second after that of the primary avalanche. Shearing as the cause of release is thus excluded, for the two slopes have approximately the same length. The second avalanche must have been fractured through ground vibrations or shock transmitted through the snow cover. Because this disturbance undoubtedly could have been much weaker than the loading of 14 moving skiers, it appears to demonstrate that avalanche conditions on this southeast slope had been much more precarious than on the opposite southwest slope of the primary avalanche. This deduction agrees with many observations made during the past winter, that the southwest slopes in relation to the southeast ones had exhibited more favorable conditions (for stability--tr.) .

2. After the initiator of the undertaking and leader of the accident party, W. Bogner, had been brought under indictment by motion of the investigating judge, he was acquitted from blame and punishment by the district court

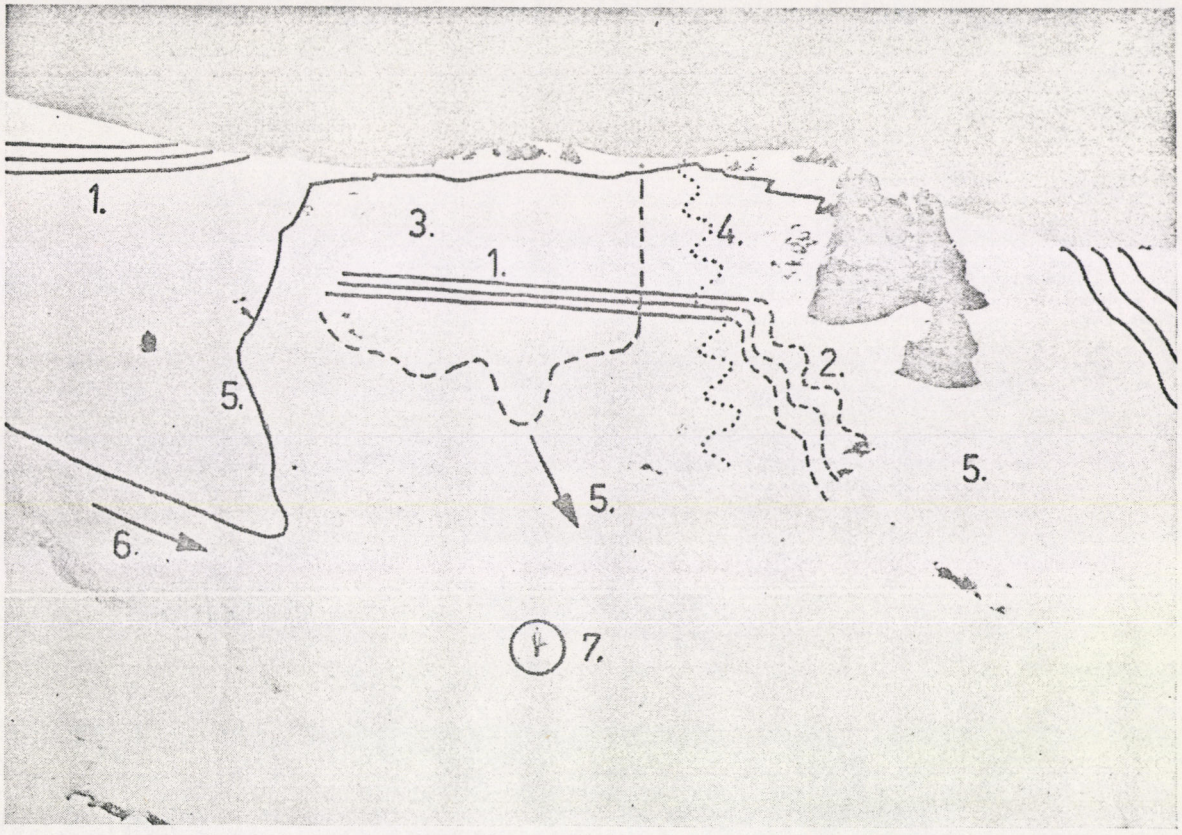
committee for Upper Engadine.

Contesting this decision, the prosecuting attorney appealed to the cantonal court committee, moving that Bogner be charged with negligent homicide under Art. 117 StGB. This appeal was successful and Bogner was conditionally sentenced to two months imprisonment (Decision of March 31, 1965). Bogner's plea of nullity to the federal court was dismissed, as well as a constitutional appeal (Decision of June 8, 1965).

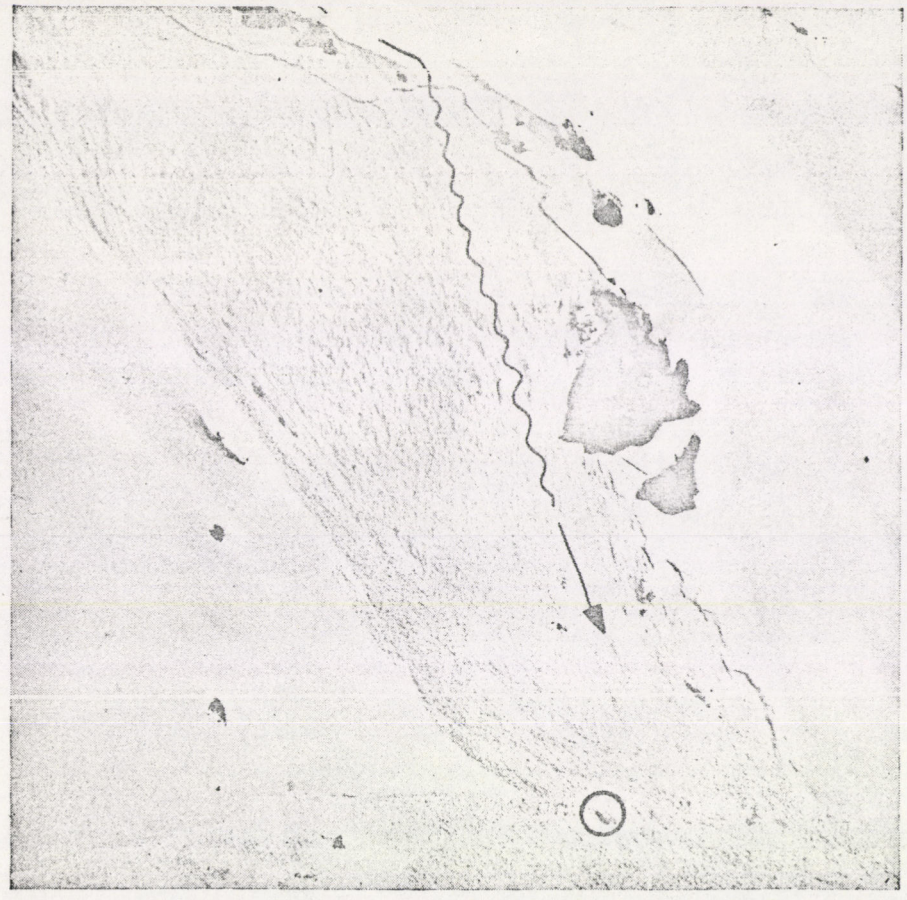
4. A fundamental significance must be attached to this decision--the first such by either cantonal or federal court about an avalanche accident. Undoubtedly it will serve as a guideline for problems of safety services, the responsibility of tour leaders, etc., and will help promote effectiveness of applicable regulations.



Fracture line profile



The accident slope with (1) ski tracks recognizable in the film, (2) probable continuation of ski tracks which unknown persons had made on the avalanche slope the afternoon of 11 April, (3) approximate region of the surface sluffs, (4) track of the accident party, (5) fracture line, lateral margins and flow direction of the accident avalanche (primary avalanche), (6) fall direction of the secondary avalanche, and (7) burial and recovery point of both victims. (Photo SLF 64 185)



The primary avalanche with line of descent and fall, and recovery point of the victims.

Left the primary, right the secondary avalanche, with burial point of the victims. (These two are aerial photos by Kdo. Fl. Trp. No. 64 186/187)